

## WHAT IS THE MONTANA EWS?

- A statistical model that can use readily available school, student, and other live data to identify students who are at risk of dropping out of school <u>before</u> they drop out.
  - The EWS allows educators to intervene early on during the process before a student has reached the point of no return.



## HOW IS THE EWS DEVELOPED?

- Compare data from dropouts to the data from high school graduates from the school years 2007-2015
- Model is found using Logistic Regression

$$\pi(x) = \frac{e^{\alpha + \beta x_1 + \beta x_2 + \dots + \beta x_n}}{1 + e^{\alpha + \beta x_1 + \beta x_2 + \dots + \beta x_n}}$$

- $\pi(x)$  is the percent chance a student will drop out of school
- Separate model is developed for each grades 6, 7, 8 and for each year of high school.



### WHAT DATA IS AVAILABLE FOR THE MODEL?

- Data stored by the State.
  - Student Data
    - SIS (AIM) Data
    - Testing Data
  - School data
    - School Demographics
    - Location
  - Census Information
    - Unemployment Rates
    - Populations

- Data stored by the Schools
  - Attendance
  - Transcripts
  - Grades
  - Discipline



## **EWS MODEL DATASET**

- Data from all Graduates and Dropouts from 2007-2017 school years at 13 school system's in Montana.
  - 13 school system's in Montana were sampled to give a good representation of schools across the state. (roughly 11,000 students per year, or about 1/6<sup>th</sup> of the statewide students in 6-12<sup>th</sup> grades)
- Data current for each student at the end of the enrollment (whether a dropout or graduate)



### **EWS HISTORY**

- Pilot Year 2012-2013 (10 School Systems involved)
  - For the 2012-2013 school year EWS Results were sent to each school once a month.
  - EWS was changed and updated many times during the school year.
- 2<sup>nd</sup> Year of EWS 2013-2014
  - Model was updated during the previous summer and remained unchanged throughout the 2013-2014 school year.
- 3<sup>rd</sup> Year of EWS 2014-2015
  - New model uses less variables that OPI does not collect (9 total)
- 4<sup>th</sup> Year of EWS 2015-2016
  - Available to all schools in GEMS
- 5<sup>th</sup> Year of EWS 2016 2017
  - Updates to current reports

6<sup>th</sup> Year of EWS 2017-2018

Updated Models and Intervention Report



### SCHOOL SYSTEMS CURRENTLY IN EWS

- Arlee
- Belgrade
- Bozeman
- Browning
- Butte
- Columbus
- Corvallis
- Cut Bank
- Frenchtown
- Great Falls
- Havre
- Hays-Lodge Pole
- Heart Butte

- Huntley Project
- Lame Deer
- Laurel
- Lewistown
- Libby
- Livingston
- Missoula
- Park City
- Polson
- Red Lodge
- St. Ignatius
- Townsend
- Wolf Point



### VARIABLES IN THE EWS MODEL

### Collected by OPI

- Moved this school year (Y or N)
- Moved from out of state (Y or N)
- Repeated a grade in K-8 (Y or N)
- Age Difference (July 15 cutoff date)\*
- Number of School systems attended since 2007
- Gender

About 300 Variables have been analyzed.

### **Not Collected by OPI**

- Attendance Rate
- # of Previous Term F's
- # of Previous Term A's
- # of Behavior Events in last 120 days
- # of Out of School Suspension Events in last 3 years
- On Track (Y or N)
- # of Credits per year
- # of Absences in last 90 days
- # of Absences in last 60 days



## TWO PARTS TO A GOOD EWS MODEL

1 2

- The Model should assign a high dropout percentage to students who end up dropping out.
  - Low dropout percentage to those that eventually graduate.
    - Can be evaluated by:
      - R squared
      - C-statistic
      - ROC Curves
      - Model AIC

- Model should be efficient in identifying dropouts above the cut-off threshold for targeting a student as At-Risk
  - A high percentage of At-Risk students end up being dropouts.
    - Can be evaluated by:
      - Confusion Matrix



### WHEN IS A STUDENT CONSIDERED AT RISK?

- At what dropout percentage should we be concerned about a student?
  - Depends on school
  - Depends on how many incorrect conclusions you will accept.

True Negative	False Negative
Model: Graduate Student: Graduate	Model: Graduate Student: Dropout
False Positive	True Positive
Model: Dropout Student: Graduate	Model: Dropout Student: Dropout

- We want to be able to identify as many dropouts as we possibly can.
- We want as many of the students as possible to be in one of the "True" boxes.
  - Small number of students in the "False" boxes.

### EWS MODEL EXAMPLES

Looking at Beginning of the Year EWS Results from 2009-2010

Only including students that had <u>all</u> data elements needed for the EWS. (4167 students total)

Must look at 2009-2010 to include 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade students and allow time for them to graduate.

512 Dropouts from group of students that were in school 2009-2010 in the Pilot Schools

### Marked as At Risk when >15%

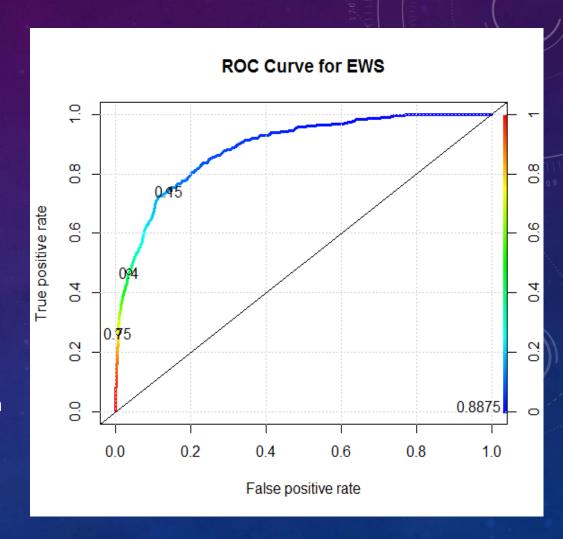
True Negative	False Negative
Model: Graduate	Model: Graduate
Student: Graduate	Student: Dropout
3132	131
75.2%	3.1%
False Positive	True Positive
Model: Dropout	Model: Dropout
Student: Graduate	Student: Dropout
523	381
12.6%	9.1%

- Dropouts found 74.4%
- Graduates found 85.7%
- Accuracy 84.3%



## **EWS MODEL DIAGNOSTICS**

- ROC Curve and c-statistic
  - Graph of Sensitivity (True Positive Rate, % of Graduates correct) vs 1-Specificity (False Positive Rate, % of Dropouts correct)
  - Probability the model will assign a higher score to a randomly chosen dropout than to a randomly chosen graduate.





### GEMS EWS RESULTS

- http://gems.opi.mt.gov/StudentCharacteristics/Pages/Early WarningSystemOverview.aspx
- EWS Results only available in GEMS Secure
  - Must get a login and access rights to the page.
- 3 Reports in GEMS
  - School Report
  - Student Summary Report
  - Student Detail Report



## SCHOOL LEVEL REPORT

- Available for every school/district you have access to
  - School or district wide results to see numbers of students being identified.
- Can compare results by Grade
- Can compare to Statewide average results
- Will display results for the last 2 EWS runs



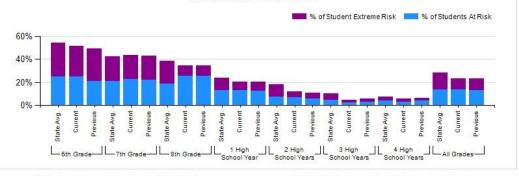
### School Dashboard : (Masked)



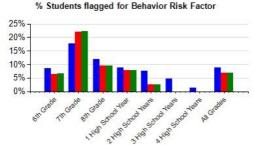
Category	Total	Percent of Total Students Enrolled	State Average		
Students Missing Data	14	1.7%	0.6%		
Students Identified	193	23.5%	28.2%		
Students At - Risk	113	13.8%	13.7%		
Students Extreme - Risk	80	9.7%	14.5%		

Total Students Enrolled	(Masked)				
Current EWS Run	04/20/2015				
Previous EWS Run	04/14/2015				
Student Summary Report (click for report)					

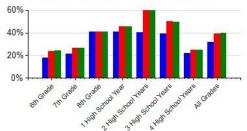
### % Students Identified as At Risk



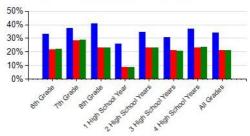
# % Students flagged for Grades Risk Factor 25% 20% 15% 0% Bit Getter History Bit Getter











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Current EWS Run

Previous EWS Run

### STUDENT SUMMARY REPORT

																		~ / /			
SC	School Name	Last Name	First	StateID	HS	Grade	Dropout	Change	Est.	Attendance	Grades	Behavior	Age	Off	Mobility	Previous	Previous	Behavior	Attendance	Grades	Mobility
			Name		Years		Prob.							Track		Dropout	Prob.	Odds	Odds	Odds	Odds
ABCD	Early Warning	Anderson	Joel	DJFHDFIEF	4	12	99.8%			Attendance	Grades			Off	Mobility	Prev	99.8%	1.00	41.45	61.25	2.21
	System School													Track		Dropout					
ABCD	Early Warning	Smith	Maria	JDUEHJDH	4	12	0.1%			Attendance							0.1%	1.00	1.89	0.32	1.00
	System School																				
ABCD	Early Warning	Lackey	Edin	BGSFWFED	3	11	9.6%	1		Attendance			Age				24.0%	1.00	2.80	0.78	1.00
	System School							*													
ABCD	Early Warning	Underman	Hal	IKJJHYGVX	3	11	6.1%	<i></i>		Attendance					Mobility		3.0%	1.22	3.23	0.57	3.19
	System School																				
ABCD	Early Warning	Grossman	Keith	JSUWEHDBH	2	10	3.9%			Attendance							3.8%	1.06	1.49	0.28	1.00
	System School																				
ABCD	Early Warning	Player	Joe	IJUJHHUUS	2	10	0.4%										0.2%	1.00	0.83	0.21	1.00
	System School																				
ABCD	Early Warning	Stein	Thomas	ODJEHDYST	1	09	70.2%	1		Attendance	Grades	Behavior		Off			59.8%	2.92	2.95	6.14	1.00
	System School													Track							
ABCD	Early Warning	Caligher	Mary	DYSYDHEGD	1	09	1.8%			Attendance							2.1%	1.00	2.40	0.12	1.00
	System School																				
ABCD	Early Warning	Thompson	Jess	UDJEHEGDB	N/A	08	81.6%	1	*	Attendance		Behavior	Age				69.0%	1.32	2.28	1.00	1.00
	System School																				
ABCD	Early Warning	Banby	Shane	MSJDHEYDG	N/A	08	8.3%	<i></i>		Attendance			Age				6.4%	1.00	2.37	0.35	1.00
	System School																				
ABCD	Early Warning	Smith	Jane	NSHDHEYRG	N/A	07	76.5%	1		Attendance	Grades						97.8%	1.00	3.59	8.46	1.00
	System School																				
ABCD	Early Warning	Anderson	Mike	MKNJBHGCC	N/A	07	13.7%	1		Attendance							36.0%	1.00	1.39	1.06	1.00
	System School																				
ABCD	Early Warning	Abbott	Megan	HUGYFTDRE	N/A	06	50.2%	1		Attendance		Behavior			Mobility		14.5%	1.85	1.39	0.62	4.92
	System School																				
ABCD	Early Warning	Cornrow	Mike	KDHSTDGXC	N/A	06	18.3%	1		Attendance							6.6%	1.23	1.35	1.05	1.00
	System School																				

Lists EWS results for every student in your district/school in an excel file (other formats available)

Names, School, and Data provided in the report is fictitious

### STUDENT LEVEL **REPORT**

- Available for every student enrolled in your school
- Displays all data used by the EWS Model
- Graphically displays the following
  - **Dropout Probability**
  - **Grades Risk Factor**
  - Attendance Risk Factor
  - **Behavior Risk Factor**
  - **Mobility Risk Factor**
- Will display results for up to the last 12 EWS results
- Attendance Risk Factor Example
  - Based on grades alone, the odds of this student dropping out is 11.18 times the odds of an average student, with all other factors held constant
  - Above 1.25 all risk factors are flagged





### Student Level Report Student Name: Jess Thompson - UDJEHEGDB

Denneut Denhahilita Ca

### Jess Thompson **UDJEHEGDB**

State ID	UDJEHEGDE
Grade	08
Age	15
Gender	F
Birth Date	Jun 5 1999
Previous Dropout	N
Repeater K-8 Grade	N
Age Difference	Over 2 Up
Moved This School Year	N
Moved From Out Of State	N
More Than 2 School Systems Attended	N
Number of HS years	N/A
Attendance Rate	0.901
Previous Term F's	
Previous Term A's	
Behavior Events In Last 120 Days	1
Out Of School Suspension Events In Last 3 Years	1

Number of HS years	N/A
Attendance Rate	0.901
Previous Term F's	
Previous Term A's	
Behavior Events In Last 120 Days	1
Out Of School Suspension Events In Last 3 Years	1
Credit/ <u>Yr</u>	
On Track	Υ
Absences Last 60 days	5.25
Absonce last 00 days	3.2

### **Dropout Probability** 81.6% **Dropout Risk Factors** Older Student Υ Off Track Ν Ν Previous Dropout Attendance Risk Factor 2.28 1.00 Grades Risk Factor 1.32 Behavior Risk Factor 1.00 Mobility Risk Factor

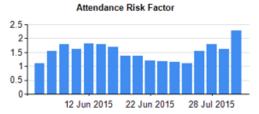
Dropout Probability Summary							
Dates Early Warning System Ran	Dropout Probability	Change					
26 Aug 2015	81.6%	1					
29 Jul 2015	69.0%	<u>*</u>					
28 Jul 2015	71.1%	1					
09 Jul 2015	60.5%	1					
30 Jun 2015	52.1%	<u>*</u>					
24 Jun 2015	57.0%						
23 Jun 2015	57.7%	<u>*</u>					
22 Jun 2015	62.2%	<u>\</u>					
19 Jun 2015	65.5%						
17 Jun 2015	65.4%	<u>*</u>					
16 Jun 2015	69.9%	<u>*</u>					
15 Jun 2015	71.1%	*					

### Dropout Probability



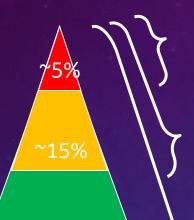








## At-Risk Tiers



TIER 3
Tertiary Prevention

EWS: Extreme Risk – 11.0% of Students

TIER 2 Secondary Prevention

EWS: At-Risk – 13.6% of Students

TIER 1
Primary Prevention

EWS: Low Risk – 75.4% of Students



~80% of Students

## **RESOURCES**

- Teacher Learning Hub Course (Using the Montana Early Warning System)
  - http://learninghub.mrooms.net/
    - Found in Self Paced courses in "Other" Section
- Montana Early Warning System Manual
  - http://gems.opi.mt.gov/StudentCharacteristics/Pages/EarlyWarningSyste mOverview.aspx
- Infinite Campus EWS Extract Manual
  - http://opi.mt.gov/Reports-Data/AIM/index.php?gpm=1 8



